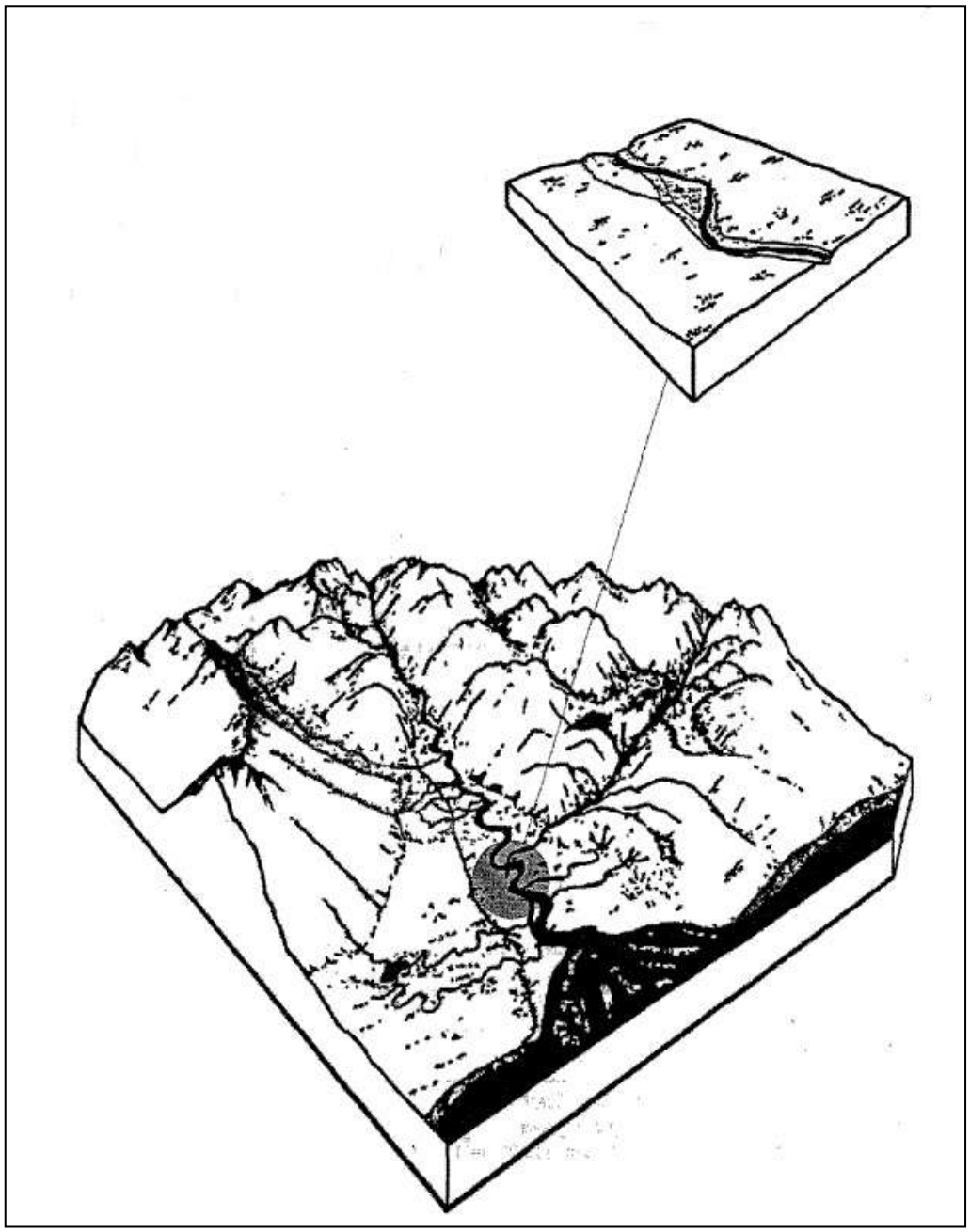
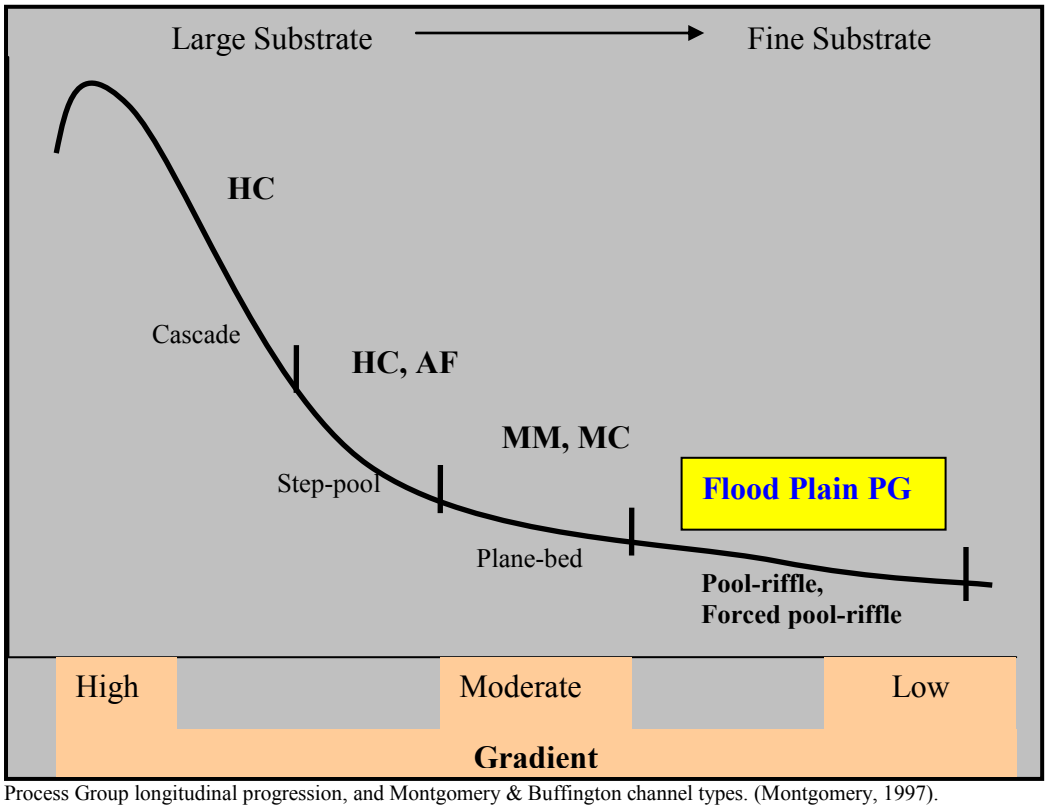
Floodplain Process Group



Flood Plain Process Group

These are low gradient (<2%) channels, situated in valley bottoms and lowlands where alluvial deposition is prevalent. High stream flows are not commonly contained within the active channel banks and some degree of flood plain development is evident. In larger river systems riparian area may extend beyond 30 meters (100ft) from the banks. These channels are dominated by well defined pools, riffles and gravel bars, often in a predictable and regular sequence. Channel banks are composed of unconsolidated alluvial material, easily eroded by stream flow. Large wood is a major component affecting pool development and stability and can create complex channel morphology (Bisson, et al 2006). Pool-riffle and forces pool (large wood creates pools) are the typical corresponding Montgomery and Buffington channel types.



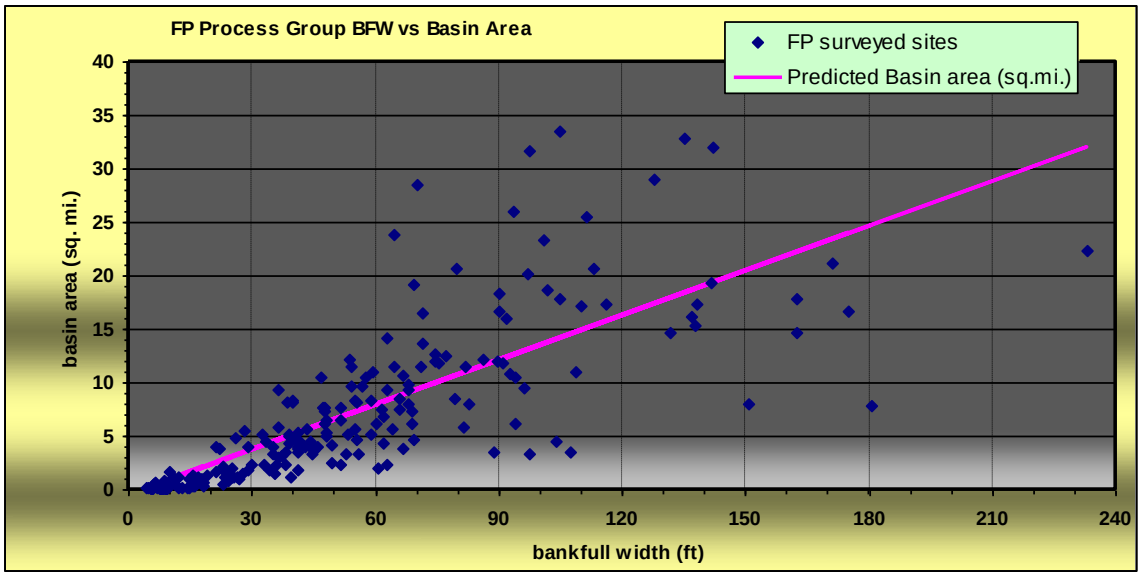
Process Group longitudinal progression, and Montgomery & Buffington channel types. (Montgomery, 1997).

Channel Type	Label	Former Label
Micro Flood Plain	**FPO**	FP0
Small Flood Plain	**FPS**	FP3
Medium Flood Plain	**FPM**	FP4
Large Flood Plain	**FPL**	FP5
Foreland Uplifted Beach	**FPB**	FP1
Foreland Uplifted Estuarine	**FPE**	FP2

Habitat Variables (latest version June, 2008)

Habitat Variable	Percentiles	FP Process Group	Habitat Variable	Percentiles	FP Process Group
WD	25	16.5	RPD/CBW	25	0.04
	50	19.3		50	0.05
	75	26.7		75	0.06
TLWD/M	25	0.26	D50	25	17
	50	0.36		50	24
	75	0.50		75	39
TKWD/M	25	0.04	PLNGTH/M	25	0.34
	50	0.10		50	0.51
	75	0.15		75	0.69
POOLS/KM	25	30	REL_SUBMRG	25	12.0
	50	45		50	24.2
	75	70		75	37.5
POOL SPACE	25	1.4	POOL_SIZE	25	0.65
	50	2.2		50	0.84
	75	3.5		75	1.23

Bankfull width (ft) vs Basin area (mi^2) for FP process group.



FPO - Micro Flood Plain Channel

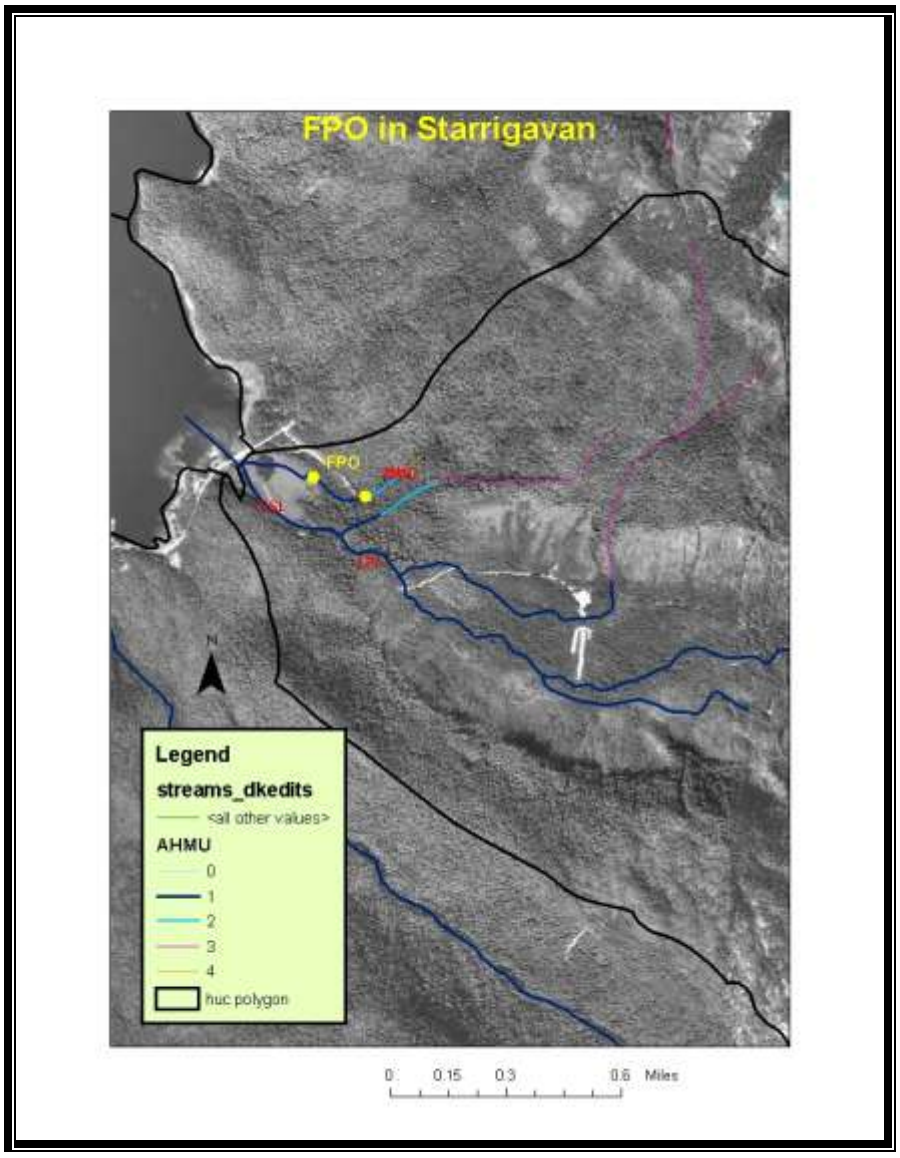


Figure 1. FPO channel in Starrigavan Creek near Sitka**.**

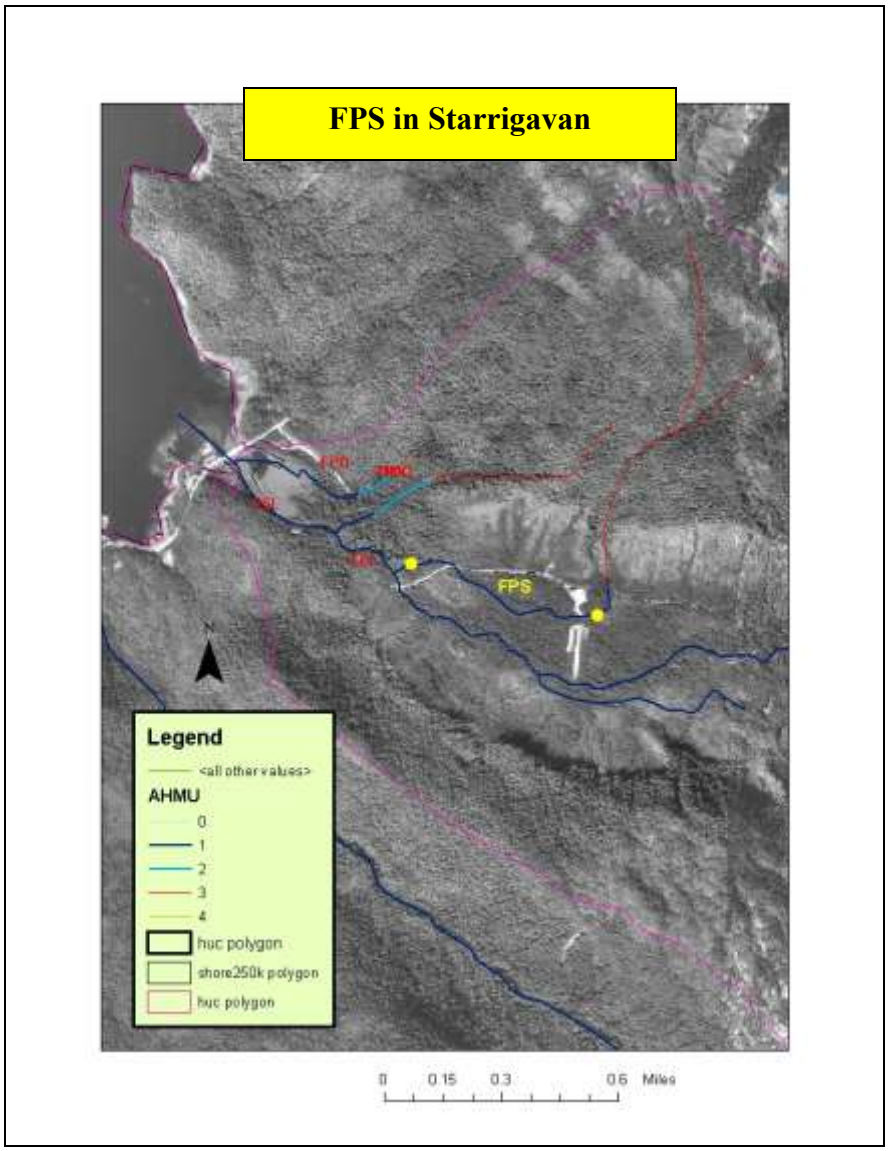
FPO- Micro Flood Plain Channel

A very narrow, low gradient, forested valley bottom channel usually situated in the riparian zone of larger scale Flood Plain channels (FPS, FPM or FPL). The FPO may connect micro footslope or palustrine channels to the main valley bottom stream. The minute size of this channel renders it undetectable on aerial photography.

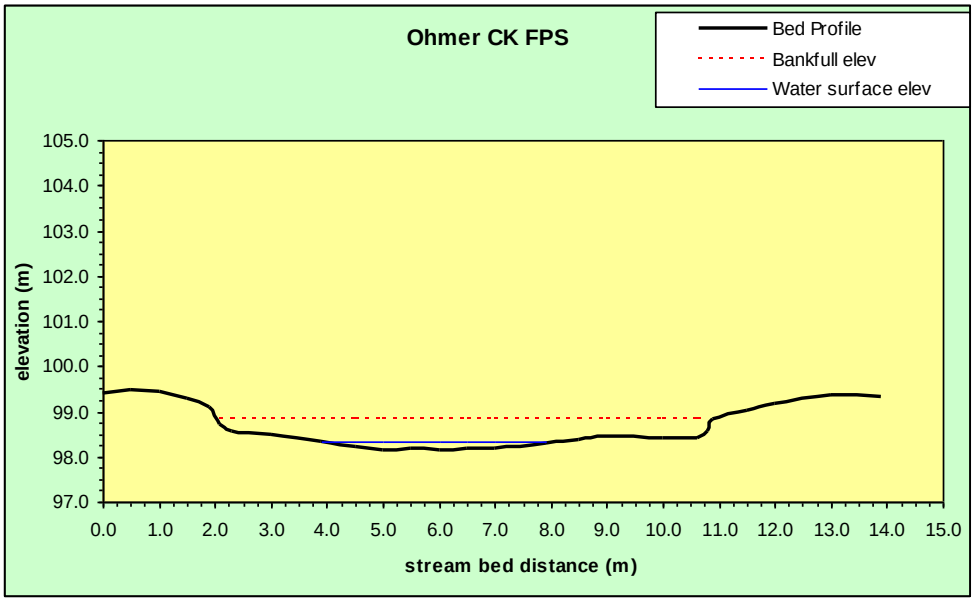
Figure 2. In channel view of Starrigavan FPO.

Stream Class: I or II
Drainage area: ≤ 0.5 km^2 (0.15 mi^2)
Stream Gradient: < 2 %
Incision Depth: < 2 m
Bankfull Width: 0.3 to 2m
Bankfull Depth: 0.5m or less
Dominant Substrate: Silt to coarse gravel.
Stream Bank Composition: Silt/sand to coarse gravel.
Sideslope Length/Angle: not applicable
Associated Landform: 53, 61, 62
Riparian Vegetation: Overstory = S.Spruce, W.Hemlock; Understory = Blueberry, Devil's Club, Skunk Cabbage
Fish Habitat: salmonid rearing habitat

FPS – Small Flood Plain Channel



Geographic setting: FPS channels are located in the valley bottom, may also occur within low lands or low elevation drainage divides. Frequently FPS streams lie adjacent to footslopes or hillslopes and the main stem of larger FP channels. Where FPS channels occur parallel to footslopes they are fed by High Gradient streams. In small drainages HCV and MMS channels may directly precede FPS channels. Less frequently FPS channels are situated on mountainslope benches.



Channel characteristics:

Stream Class	**I or II**		**Drainage area**	**0.1-14 km^2 (0.5 - 5.5 mi^2)**
Stream gradient	**< 2%**		**Incision depth**	**<2m**
Bankfull width	**2-10m** mean-5m		**Bankfull depth**	**≤ 1m**
Dominant substrate	**Silt to coarse gravel**		**Streambank compostion**	**Silt/sand to coarser gravel**
Sideslope length/angle	**n/a**		**Associated landform**	**53 (flat floodplain)**

Plant Association Series	% cover			
	FPS	FPSm	FPSf	FPSs
Sitka Spruce	36	---	82	3
Western Hemlock	23	---	---	---
Mixed Conifer	16	---	---	---
Shore Pine	---	11	---	---
W.Hemlock/Red Cedar	11	14	---	---
Non forest	7	75	17	90

Riparian Vegetation: The riparian area is dominated by Sitka Spruce and Western Hemlock series. Salmonberry and alder shrub communities are the dominant non-forest riparian plant communities. Willow shrub and sedge/sphagnum bog communities are the primary riparian vegetation in the FPSw phase. Sitka alder and willow shrub communities define the FPSh phase.

FPS phases:

- **FPSa – Volcanic Ash Phase** is primarily found on Kruzof Island. Stream bank composition is influenced by poorly consolidated volcanic ash and breccias. Stream bank and sideslope sensitivity may be higher than is typical for this channel type.
- **FPSf – Foreland Outwash Forested Phase** is influenced by groundwater influx from shallow alluvial aquifers. Fish habitat capability may be higher due to temperature moderation by groundwater.
- **FPSh – Foreland Outwash Shrub Phase** is also controlled by groundwater inflow. Rearing habitat may be less than the FPSf due to lack of large woody debris and, as a consequence, less pool structure and cover habitat.
- **FPSp – Beaver Dam Complex Phase.** Beavers will build dams across FPS channels, creating a pond within an FPS channel. This pond is considered an inclusion within the FPS reach.
- **FPSw – Wetland Phase** is defined by muskeg/scrub forest riparian vegetation. Fish spawning and rearing habitat capabilities may be lower than forested FPS channels.

Management Considerations

Hydrologic Function: FPS channels are sediment deposition systems. Sediment routed from high and moderate gradient channels is temporarily stored in-channel and on the adjacent flood plain. Sand and fine gravel point bars are common streambed features. Sensitive stream banks, constantly affected by constructive and erosive forces, also contribute to the sediment load in FPS channels. Large wood accumulations are frequent and retain significant volumes of fine sediment. Stream power is low, allowing for massive mobilization of sediment only during peak flow events.

Indicator Species Ratings		
MIS	**ASA**	**ARA**
Coho	High	High
Pink	Moderate	Negligible
Chum	Moderate	Negligible
Sockeye	High	Negligible
Chinook	Low	Negligible
Steelhead	Moderate	High
Dolly Varden	High	High

Aquatic Habitat: FPS are usually accessible to anadromous fish and receive moderate to high spawning use by all anadromous species with the exception of Chinook salmon. FPS channels adjacent to lakes are utilized by resident fish. FPS segments, located next to accessible lakes, provide excellent spawning habitat for sockeye and steelhead salmon and sea-run cutthroat trout. FPS channels also provide rearing habitat for coho, steelhead and Dolly Varden. Deep pools associated with woody debris and beaver ponds provide overwintering habitat.

Aquatic Habitat Capability

Large wood	**4000 ft^3 /1000 linear ft**
Available Spawning area (ASA)	**Average = 21% for 53 sites**
Available Rearing area (ARA)	**Average = 49% for 53 sites**

Table_ . Habitat Variables for FPS channels.

Variable	Percentiles	FPS	Variable	Percentiles	FPS
WD	25	10.9	RPD/CBW	25	0.06
	50	14.9		50	0.07
	75	19.0		75	0.09
TLWD/M	25	0.24	D50	25	22
	50	0.40		50	27
	75	0.55		75	39
TKWD/M	25	0.10	PLNGTH/M	25	0.35
	50	0.17		50	0.58
	75	0.25		75	0.69
POOLS/KM	25	30	REL_SUBMRG	25	10.6
	50	40		50	14.0
	75	70		75	23.1
POOL SPACE	25	2.2	POOL_SIZE	25	0.67
	50	3.2		50	1.14
	75	5.1		75	1.58

Riparian Management Considerations:

Management concern for:	
Large woody debris	High
Sediment retention	High
Stream bank stability	Moderate
Sideslope sensitivity	N/A
Flood Plain protection	Moderate
Culvert fish passage	Moderate

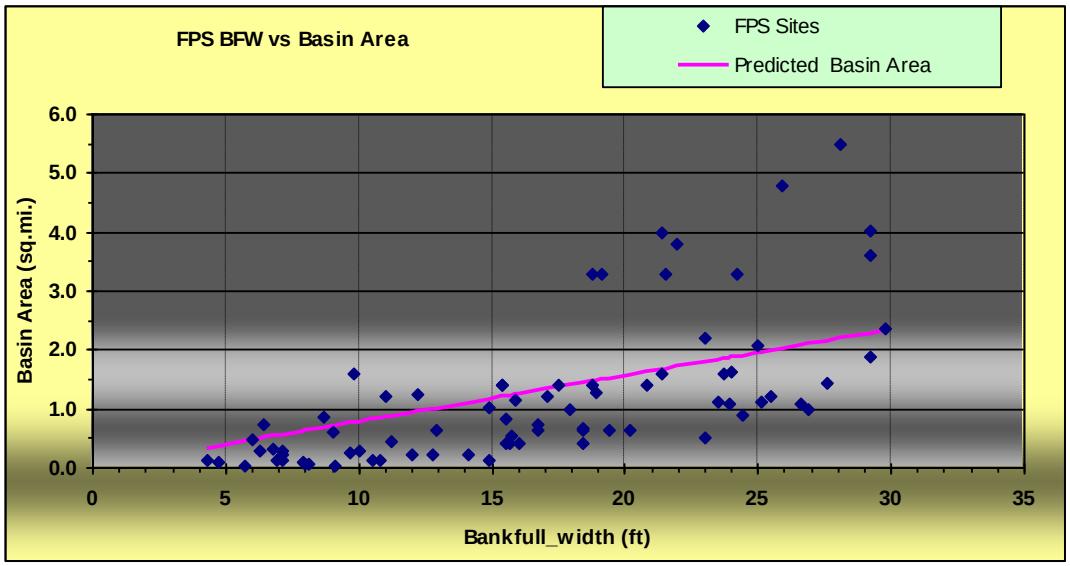
Large wood has a significant influence of FPS channel structure by increasing the frequency and size of pools. Large wood helps form scour pools. The cover provided by large wood greatly improves rearing habitat.

Sediment retention is high in FPS channels, which are often associated with large flood plain complex and may be influenced by flooding from adjacent mainstem rivers. Increased sediment loading in these channels or in upstream channels could adversely impact spawning gravels. Riparian management should emphasize measures that reduce the potential for erosion and stream bank disturbance (BMPS 12.6. 13.11, 13.16, 14.9-14.11)

Stream banks are composed of coarse to fine textured alluvium, which, due to low stream flow volume and relatively low stream power, are only moderately sensitive to disturbance.
Generally, flood plains for FPS channels are narrow. However, the channels are often associated with large mainstem river flood plain complexes.
Concern for providing fish access through culverts in FPS channels is moderate. Improperly installed or poorly designed culverts can restrict juvenile and adult fish passage by creating velocity barriers or bed scour at culvert outlets (BMP 14.17). Control of in-channel operations is an important riparian management concern for these streams (BMP 14.14).
These are typically classified as Class I streams. A minimum 100 foot timber harvest buffer is required along both banks (Tongass Timber Reform Act, 1991).

Management Opportunities:
FPS channels offer excellent opportunities to improve available rearing habitat through placement of large woody debris. Enhancement efforts can focus on over-wintering habitats. These channels also contain habitat which is characteristically preferred by beaver. Encouragement of beaver colonization can greatly expand fish rearing potential in FPS streams.

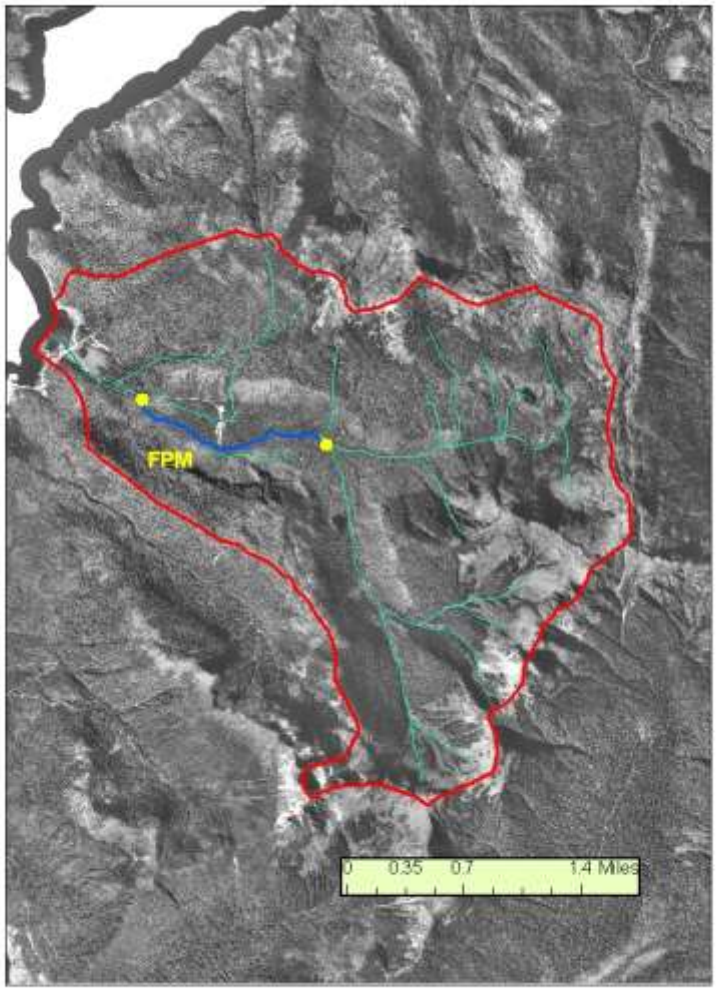
Bankfull width and drainage area statisitics:



FPS statistics	feet	meters	mi^2	km^2
mean bfw	16.6	5.1		
mean basin area			1.2	3.1
max basin area			5.5	14.2
min basin area			0.03	0.1
n=78				

Drainage basin ranges from 0.03 to 5.5 mi^2.
Most FPS are below 2 mi^2 in drainage area.

FPM - Low Gradient Moderate Width Flood Plain Channel



Geographic Setting: FPM channels are mainstem stream in broad valley bottoms that generally have extensive flood plains. Alluvial fans, dissected foootslopes and hillslopes or lowland landforms may directly abut FPM flood plains. These channels are sinuous, with extensive gravel bars, multiple channel-ways and alluvial terraces. Normally FPM reaches are situated at the lower portion of watersheds with 2 to 15 mi^2 drainage areas.

Channel characteristics:

Stream Class	**I or II**		**Drainage area**	**5 ≤ 15 mi^2**
Stream gradient	**< 2%**		**Incision depth**	< **2m** (6.6 ft)
Bankfull width	**10-20 m** (33-66 ft)		**Bankfull depth**	**≤ 1m**
Dominant substrate	**Sand to cobble**		**Streambank compostion**	**Alluvium**
Sideslope length/angle	**n/a**		**Associated landform**	**53 (flat floodplain)**

Riparian Vegetation: The riparian area is dominated by Sitka Spruce and Western Hemlock series. Common non-forest shrub communities include slamonberry, red alder, Sitka alder, devil's club, and willow. These non-forest communities are significant in the FPMf and FPMh phases. The shore pine/crowberry plant association is significant in the FPMw phase along with sedge/sphagnum

Plant Association Series	**% cover**				
	FPM	**FPMb/c**	**FPMw**	**FPMf**	**FPMh**
Sitka Spruce	51	44	14	35	3
Western Hemlock	23	27	7	9	---
Non-forest	13	18	37	42	97
Mixed Conifer	7	4	5	---	---
Shore Pine	---	---	24	---	---
Sitka Spruce-Cottonwood	---	---	---	14	---

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Channel Type Phases:

- **FPMa – Volcanic Ash Phase** is limited to areas with geologically recent volcanic deposits, such as Kruzof Island. Stream bank and substrate composition consists of scoria and ash particles.
- **FPMb/c – Boulder or Cobble Substrate Phase** has greater stream power than typical for FPM channels, thus functioning as a more efficient sediment transporter. Substrate material is larger and large wood has less influence on channel dynamics. If boulders are present channel is designated FPMb, if cobbles constitute the largest percentage of substrate material, FPMc is the code to use.
- **FPMf - Foreland Outwash Forested Phase** includes alluvial flood plain channels that are dependent on groundwater recharge. This phase is restricted to coastal foreland landforms with early successional Sitka Spruce riparian stands.
- **FPMh - Foreland Outwash Shrub Phase** includes foreland groundwater streams with shrub or muskeg riparian vegetation.
- **FPMw – Wetland Phase** is associated with low gradient muskegs and meadows. However, pool/riffle morphology, and gravel deposits make these channel more similar to the Flood Plain Process Group versus those categorized in the Palustrine Process Group.

Management Considerations

Hydrologic Function: FPM channels provide temporary fine sediment storage through deposition in pools, point bars and on the flood plain. Bank erosion and bank building processes are continually at work resulting in very dynamic and diverse channel morphology. Channel gradient is low and flow containment is poor resulting in relatively low stream power. Sand and fine gravel constitute a large percentage of the substrate material. Large woody is also a major component influencing sediment entrapment and channel morphology. Stored sediments are mobilized and transported downstream during high flow events.

Aquatic Habitat: Rearing area is abundant due in part to large wood accumulations. Spawning habitat is abundant due to the gravel to cobble size substrate. The large wood is distributed uniformly throughout the length of stream. Winter habitat can be significant in side channel pools and where large wood creates deep pools and low stream velocity. Large wood associated with pool habitat is very important to both rearing juveniles and migrant adult salmonids. Undercut alluvial banks and root mats from riparian forest vegetation also provides rearing habitat. Rearing habitat diversity is enhanced by the frequent occurrence of slough, beaver ponds and very small groundwater tributaries associated with FPM channels.

Indicator Species Ratings		
MIS	**ASA**	**ARA**
Coho	High	High
Pink	High	Negligible
Chum	High	Negligible
Sockeye	High	Negligible
Chinook	Moderate	Moderate
Steelhead	High	High
Dolly Varden	High	High

Aquatic Habitat Capability:

Large wood	**9000 ft^3 /1000 linear ft**
Available Spawning area (ASA)	**Average = 24% for 62 sites**
Available Rearing area (ARA)	**Average = 35% for 62 sites**

Habitat Attributes and Percentiles for FPM channel type.

Variable	Percentile	FPM	Variable	Percentile	FPM
WD	25	18.5	RPD/CBW	25	0.04
	50	20.2		50	0.04
	75	32.8		75	0.05
TLWD/M	25	0.31	D50	25	15
	50	0.37		50	19
	75	0.50		75	34
TKWD/M	25	0.06	PLNGTH/M	25	0.38
	50	0.11		50	0.54
	75	0.15		75	0.70
POOLS/KM	25	30	REL_SUBMRG	25	26.5
	50	40		50	36.9
	75	60		75	49.4
POOL SPACE	25	1.3	POOL_SIZE	25	0.68
	50	1.8		50	0.84
	75	2.2		75	0.94

Riparian Management Considerations:

Management concern for:	
Large woody debris	High
Sediment retention	High
Stream bank stability	Moderate
Sideslope sensitivity	N/A
Flood Plain protection	High
Culvert fish passage	High

Large wood accumulations are important factors in shaping FPM channel morphology. In-channel woody debris volume is usually high and distributed throughout most forested FPM stream segments. Flood flows are capable of redistributing debris to a limited extent in these channels. Maintenance of fish habitat is dependent upon continuous input of large stable wood over time (BMP 12.6).

These low gradient depositional channels are sensitive to sediment introduction from headwater areas, and retention of fine gravel and sand size sediment is high. Therefore, these channels are susceptible to cumulative sediment impacts on fish habitat. Stream banks are composed of fine alluvium and are susceptible to erosion. Removal or disturbance of stream bank vegetation and root mates can result in accelerated bank erosion and breakdown of undercut bank habitat. Riparian management prescriptions should emphasize erosion control (BMPs 13.11,14.9,14.11), stream bank protection (BMPs 13.16 and 14.17), and control of in-channel operations (BMP 14.14).

FPM streams are generally associated with extensive and complex riparian areas that include such features as sloughs, side channels, beaver pond complexes, and small spring fed tributary channels. Riparian area protection (BMPs 12.4, 12.6) is very important for maintaining water quality and rearing habitat.

Bridges are required to cross FPM channels. Culvert installation on small flood plain tributary channels (often not mapped) must provide for upstream juvenile fish passage (BMP 14.17).

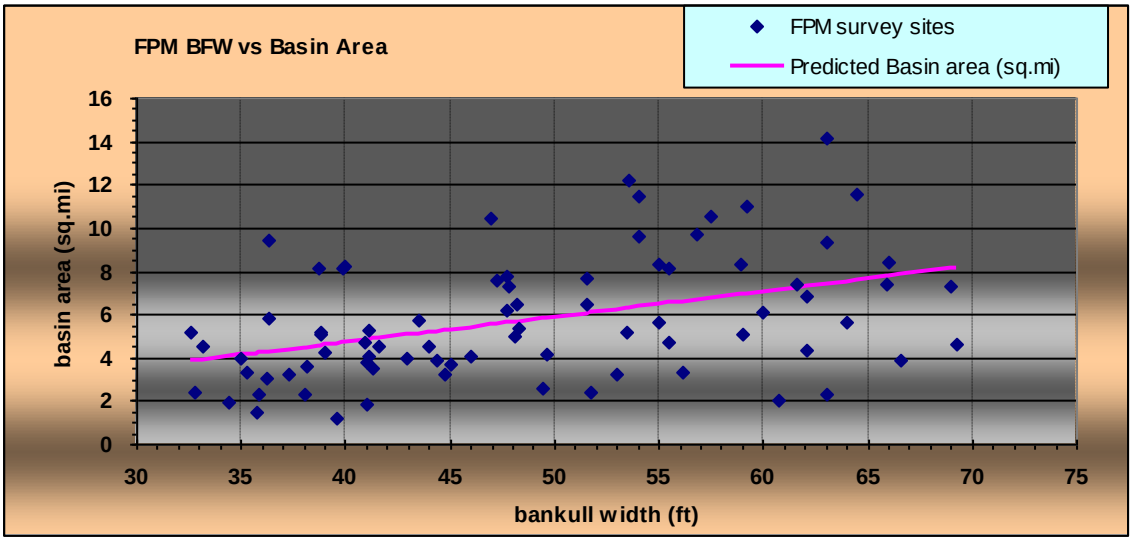
A minimum 100 foot timber harvest buffer is required along both banks, as FPM channels are typically Class I (Tongass Timber Reform Act, 1991).

Riparian Management Opportunities
Sport fish potential……..High
Enhancement opportunities …Large wood placement, fry stocking, spawning channels.

FPM channels offer excellent sport fish opportunities, primarily for Dolly Varden, coho salmon, pink salmon, and steelhead. Deep pools along meander bends associated with large log jams offer the best angling. Access by small boat to the channel itself is limited due to low water levels in the summer and numerous log jam obstructions.

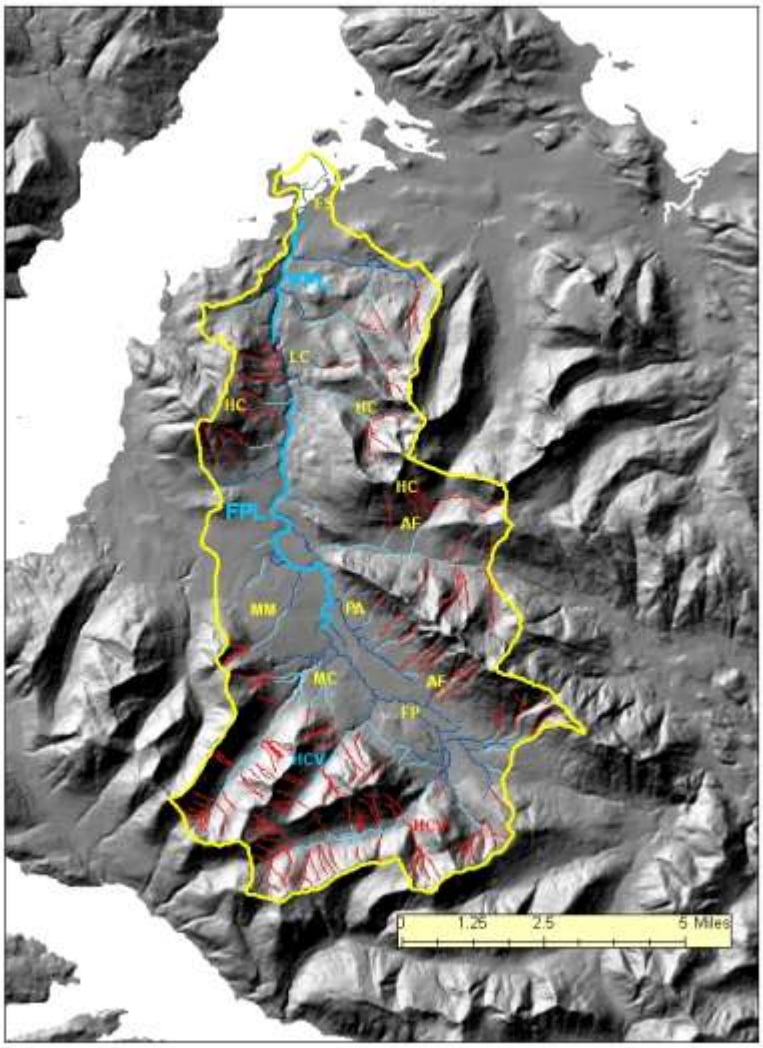
A variety of enhancement opportunities exist for FPM channels. Large wood projects could be evaluated where rearing habitat is limited. Fry stocking could be done when downstream fish barriers have been eliminated or laddered. Construction of flood plain spawning channels is a potential enhancement opportunity where shallow groundwater sources are present.

FPM Drainage Basin Statistics



FPM statistics	feet	meters	mi^2	km^2	n
mean bfw	48.8	14.9			78
mean basin area			5.7	14.8	
max basin area			14.2	36.7	
min basin area			1.2	3.1	

FPL - Large Low Gradient Floodplain Channel

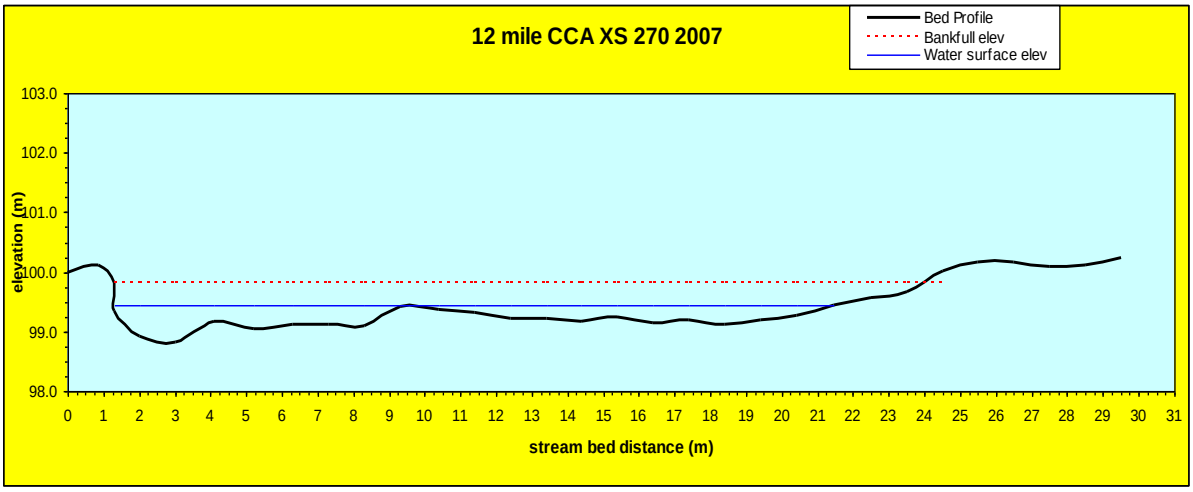


Geographic Setting: FPL channels are found in broad valley bottoms of large to very large watersheds. These channels have extensive valley flood plains and river terraces. Smooth meander bends, numerous overflow side channels, extensive gravel bars, and large log jams are common features.

Channel characteristics:

Stream Class	**I or II**		**Drainage area**	**> 10mi^2**
Stream gradient	**< 2%**		**Incision depth**	< **2m** (6.6 ft)
Bankfull width	**> 20 m** (66 ft)		**Bankfull depth**	**≤ 2m**
Dominant substrate	**Sand to cobble**		**Streambank compostion**	**Alluvium**
Sideslope length/angle	**n/a**		**Associated landform**	**53 (flat floodplain)**

Typical cross-section profile for an FPL channel.



Riparian Vegetation: The FPL riparian communities are dominated by the Sitka Spruce series, the Western Hemlock series and non-forested communities. The most common non-forest species are Sitka alder, willow, and salmonberry.

Plant Association Series	% cover					
	FPL	FPLb/c	FPLr	FPLw	FPLf	FPLh
Sitka Spruce	49	38	37	28	56	15
Non-forest	23	54	6	44	37	79
Western Hemlock	23	---	41	5	6	---
Western.Hemlock-Red Cedar	---	3	13	---	---	---
Mixed Conifer	2	3	3	8	---	---
Sitka Spruce-Cottonwood	---	---	---	2	---	4
Shore Pine	---	---	---	13	---	---

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Channel Type Phases:

- **FPLb/c – boulder or Cobble Substrate Phase** has greater stream power channels, is a more efficient sediment transporter and has a higher substrate D50 higher than the typical FPL. If boulders are present channel is designated FPLb, if cobbles constitute the largest percentage of substrate material, FPLc is the code to use.
- **FPLr- Bedrock phase,** significant inclusions of bedrock stream bed or stream bank knickpoints.
- **FPLf - Foreland Outwash Forested Phase** includes alluvial channels that are strongly influenced by groundwater recharge from shallow aquifers. This phase is restricted to coastal foreland landforms. Sitka Spruce communities dominate the riparian vegetation.
- **FPLh - Foreland Outwash Shrub Phase** are groundwater fed, coastal foreland channels, with predominantly non-forested riparian plant communities.
- **FPLw – Wetland Phase** riparian area consists of muskeg, meadows or scrub wetland forest. This is an alluvial channel with significantly greater sediment transport capacity than Palustrine channels that have similar riparian vegetation.

Management Considerations

Hydrologic Function: The FPL channel functions as a sediment deposition system. Low gradient, poor flow containment, and fine sized substrate are indicative of low stream power. Substrate consists mainly of sand to small cobble size particles. Short term storage of fine sediment is characteristic of FPL channels. These fine sediment deposits are typically mobilized during high flow events. Small side channels dissecting the FPL flood plain are a common feature.

Aquatic Habitat Capability:

Large wood	**4000 ft^3 /1000 linear ft**
Available Spawning area (ASA)	**Average = 27% for 56 sites**
Available Rearing area (ARA)	**Average = 29% for 56 sites**

Indicator Species Ratings		
MIS	**ASA**	**ARA**
Coho	High	High
Pink	High	Negligible
Chum	High	Negligible
Sockeye	High	Negligible
Chinook	High	High
Steelhead	High	High
Dolly Varden	High	High

FPL channels are heavily used by spawning Chinook, chum and pink salmon, and steelhead because of the abundance of high quality spawning gravels. These channels get only moderate use by spawning coho salmon which prefer smaller channels. All freshwater rearing species make frequent use of these channels because rearing habitats readily available, primarily in association with side channels, off-channel pools, and streams segments having large wood accumulations. Over-wintering habitat in these channels is provided by off-channel slough areas and pools associated with large wood.

FPL Habitat Attributes

Variable	Percentile	FPL	Variable	Percentile	FPL
WD	25	23.1	RPD/CBW	25	0.03
	50	27.2		50	0.03
	75	43.6		75	0.03
TLWD/M	25	0.15	D50	25	17
	50	0.17		50	20
	75	0.46		75	53
TKWD/M	25	0.02	PLNGTH/M	25	0.18
	50	0.03		50	0.42
	75	0.08		75	0.44
POOLS/KM	25	10	REL_SUBMRG	25	11.4
	50	20		50	25.8
	75	25		75	52.2
POOL SPACE	25	1.7	POOL_SIZE	25	0.58
	50	2.7		50	0.65
	75	3.2		75	0.95

Management concern for:	
Large woody debris	High
Sediment retention	High
Stream bank stability	Moderate
Sideslope sensitivity	N/A
Flood Plain protection	High
Culvert fish passage	N/A

Riparian Management Considerations: Maintaining future sources of large wood is an important consideration in FPL channels. Natural large wood volume is moderate but less stable than in smaller FP channels due to higher flood flows.

Retention of find sediment (sand, gravel) is often high in FPL channels, therefore, these channels may be sensitive to cumulative sediment inputs from headwater sources. Excessive sediment loads can degrade spawning gravel quality and, in extreme cases, can disrupt sediment transport equilibrium and channel stability. Removal or disturbance of stream bank vegetation can accelerate bank erosion and the subsequent loss of undercut bank rearing habitat. Riparian management should emphasize stream bank protection and erosion

control measures to minimize potential sediment sources (BMP 13.11, 13.16, 14.9-14.11).

Flood plain protection is a very important management consideration for FPL channels because of off-channel features which contribute to juvenile fish rearing habitat (BMP 12.4, 12.6). These off-channel flood plain features include small spring fed tributaries, sloughs, beaver pond complexes, and side channels.

The location and design of stream crossing structures is an important consideration due to the large size and natural instability of the channels and associated flood plains (BMP 14.2, 14.3, 14.14, 14.17). Large multi-span bridges are often required to cross these channels. Roadways traversing flood plain tributaries must provide for juvenile fish migration through culverts.

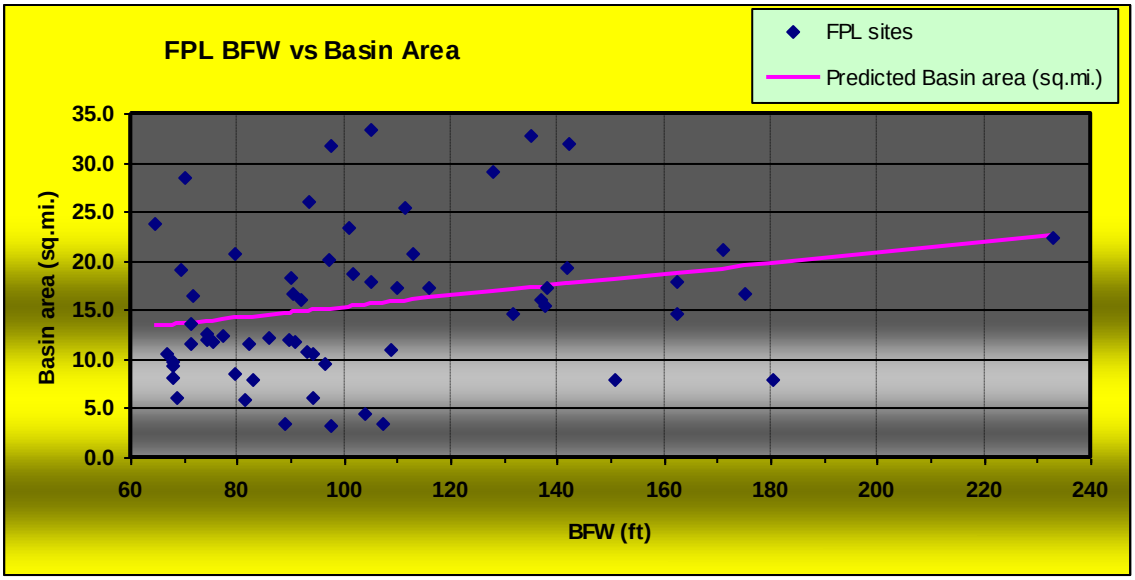
These are classified as Class I streams. A minimum 100 foot timber harvest buffer is required along both banks (Tongass Timber Reform Act, 1991). Control of in-channel operations is an important riparian management concern for these streams (BMP 14.14).

Riparian Management Opportunities
Sport fish potential……..High
Enhancement opportunities …Large wood placement, fry stocking, spawning channels.

The FPL channels can offer excellent sport fish opportunities where easy beach access exists. Species of primary interest include Dolly Varden char, cutthroat trout, steelhead, coho, pink, and Chinook salmon. Small boat access in these channels can be good depending on the amount and distribution of large debris jams. Angling is best in deep meander pools and along undercut banks.

A variety of fish habitat enhancement opportunities exists in FPL channels. Large wood may be limiting. Addition of large wood along channel margins can be successful if the structures are will anchored to the stream bank. Fry stocking programs can be implemented to take advantage of under utilized rearing habitat. Spawning channel construction is a potential enhancement option where adequate groundwater upwelling is present.

FPL Drainage Basin Statistics



FPL statistics	feet	meters	mi^2	km^2	n
mean bfw	104.3	31.8			61
mean basin area			15.5	40.2	
max basin area			33.5	86.7	
min basin area			3.3	8.5	

Flood Plain Channels and Beaver Dam Complex

Beavers can have a dramatic effect on morphology of flood plain channels. Beaver dam inclusions on gravel bed flood plain channels may be too short of length to depict as a separate channel type i.e. PAB. A riffle/pool sequence may exist immediately upstream and below the beaver dam. These dams are easily ruptured by high flow events once abandoned and no longer actively maintained by beavers. After the dam ruptures a layer of fine sediment may remain on the adjacent flood plain.

These dams are temporary and may not be apparent on aerial photos and orthophotos due to obscuring canopy or post dating the photography.

Proposed mapping label: FP*X*p. *X* = S, M or L

The flood plain is the dominant channel type, and the beaver dams are temporary structures. Depending on project needs depicting these dams as separate channel types in the project stream layer is an option. In the corporate stream layer the FPXp label would be used. National wetland mapping and the soils layer may also be useful in identifying these complex channels.

Figure 3. Beaver dam on FPS (formerly FP3) , note gravel bed below dam, wetland vegetation upstream.

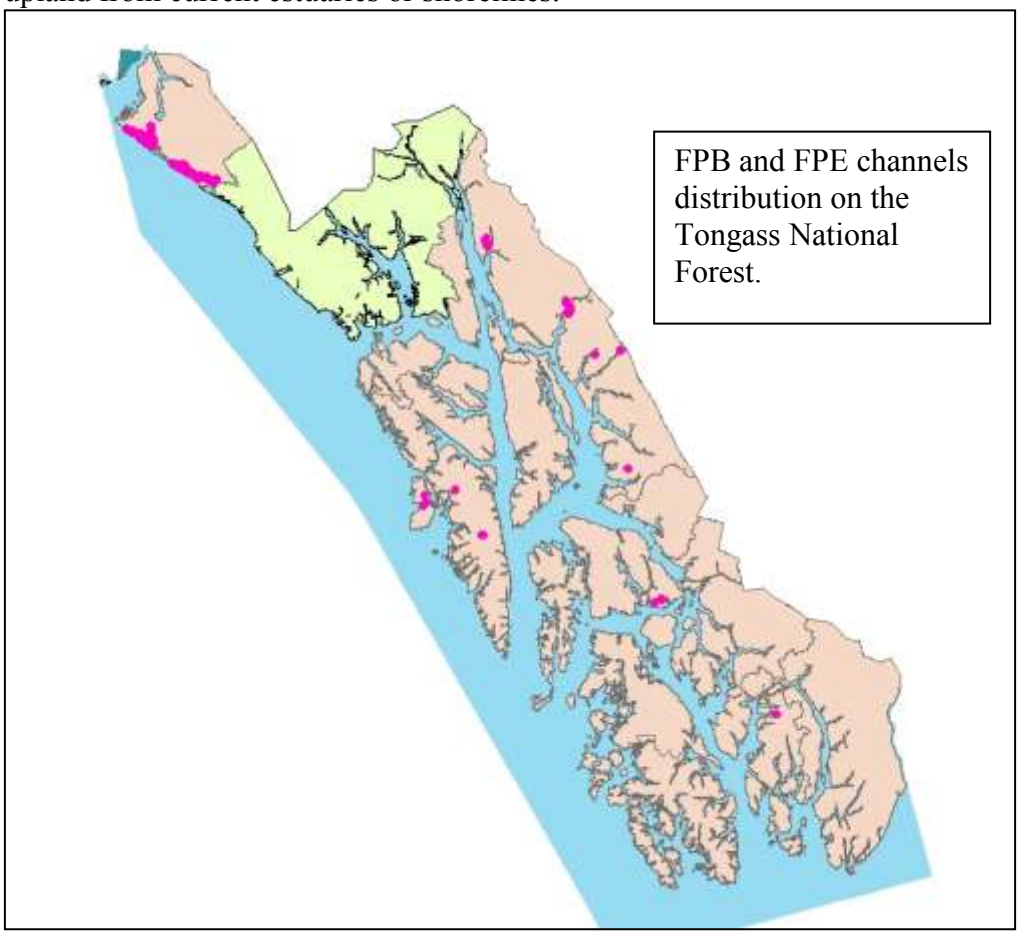
Figure 4. View from further downstream, forested riparian vegetation, riffle section.

Figure 5. FP channel above beaver dam, coarse gravel substrate.

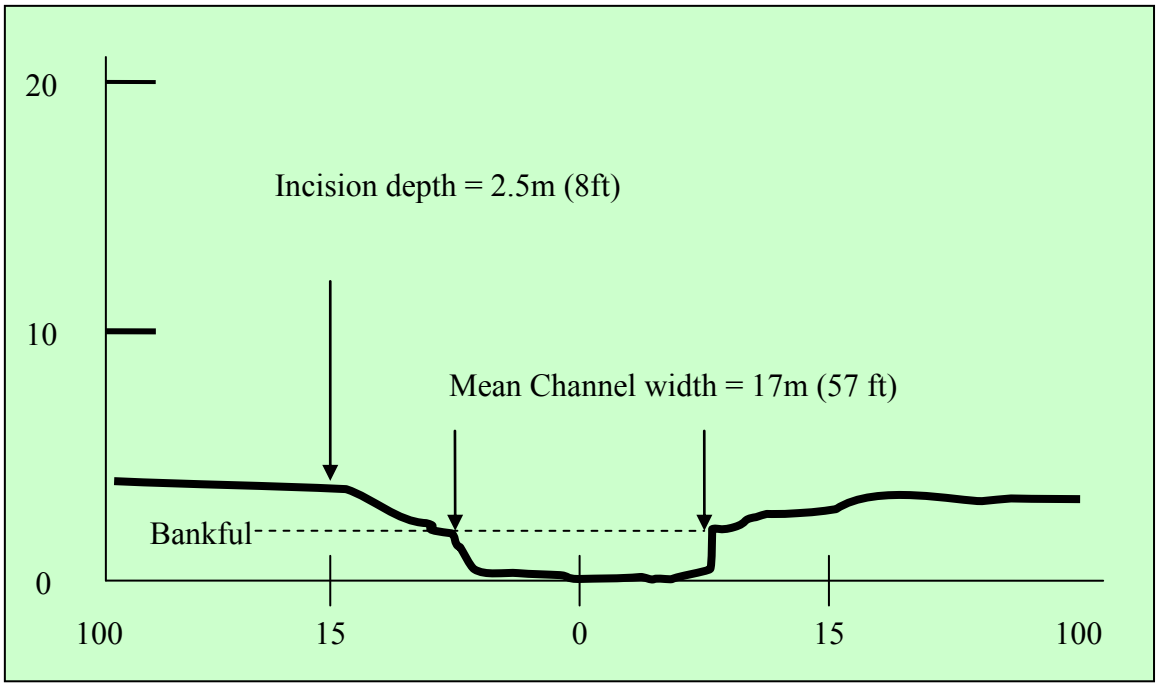
FPB and FPE – Foreland Uplifted Beach and Esturary Flood Plain Channels

(formerly FP1 and FP2, respectively)

Geographic Setting: The FPB and FPE channels occur on shore areas of glacial forelands such as Yakutat or mainland glacial river systems. They may flow parallel to the coastline when occupying depressions between relic beach deposits or flow through uplifted estuarines. These channels are located in the lower reaches of drainage basins but upland from current estuaries or shorelines.



FPB and FPE channels distribution on the Tongass National Forest.



Channel characteristics:

Stream Class	**I or II**		**Drainage area**	**26-52 km^2 (10-20 mi^2)**
Stream gradient	**< 1%**		**Incision depth**	< **2.5m** (8 ft)
Bankfull width	**Variable mean = 17m**(57 ft)		**Bankfull depth**	**≤ 2m**
Dominant substrate	**Silt, sand,fine gravel**		**Streambank compostion**	**Fine Alluvium**
Sideslope length/angle	**n/a**		**Associated landform**	**70s coastal landforms**

Riparian Vegetation
The riparian plant associations for the FPB are distinguished by two phases:
FPBf and **FPEf**– Forested phase. Riparian vegetation has co-dominant spruce and non-forest plant communities. In-channel large wood recruitment is a significant factor influencing fish rearing capability in some channel reaches.
FPBs and FPEs – Non-forested phase. Riparian vegetation is dominated by shrub and muskeg bog plant communities (sedge, sphagnum, and sweet gale).

Hydrologic Function
FPB and FPE channels are depositional and retain a high proportion of fine sediments. These channels have low stream energy due to the low gradient and poor containment. The high silt content of the stream bed and banks, and the proximity to glacial outwash channels result in a high suspended sediment load. Significant amounts of in-channel fine sediment can be held in pools and sand bars.

Aquatic Habitat Capability:

Large wood	**< 1000 ft^3 /1000 linear ft**
Available Spawning area (ASA)	**Insufficient data**
Available Rearing area (ARA)	**Insufficient data**

Indicator Species Ratings		
MIS	**ASA**	**ARA**
Coho-FPB	Low	HIGH
Coho-FPE	Low	Moderate
Pink	Negligible	Negligible
Chum	Negligible	Negligible
Sockeye	Low	Low
Chinook	Negligible	Negligible
Steelhead	Negligible	Negligible
Dolly Varden	Low	Moderate

FPB and FPE channels are accessible to anadromous species. Substrates are composed predominantly of sand and silt, which limits spawning capability for salmonid species. These channels provide some rearing potential with moderate use by coho salmon and Dolly Varden char, and occasional use by sockeye salmon. These channels may provide some over-wintering habitat, especially when large wood is present, however large wood recruitment is low in these streams.

Management concern for:	
Large wood-FPB	Moderate
Large wood-FPE	Low
Sediment retention	High
Stream bank stability	High
Sideslope sensitivity	N/A
Flood Plain protection	Moderate
Culvert fish passage	Moderate

Riparian Management Considerations:
Large wood influence on channel morphology and fish habitat is generally low to moderate for these channels due to the geographic setting. These channels are found on uplifted coastal embayments that are dominated by muskeg vegetation types. Sediment retention is naturally high for gravel and sand size material. However, sediment inputs generally have limited effects on habitat in FPB channels, due to little available spawning habitat.
Stream banks are composed of relatively cohesive silt particles. This material has relatively low bearing strength and is susceptible to earth flow type failures if physically disturbed. This can create problems for bridge design and installation of road crossings (BMPs 13.16, 14.2, 14.3, 14.17).

Protection of important wetland values and functions is an important management consideration for FPB and FPE riparian areas (BMPs 12.4-12.6)

FPB and FPE channels are classified as Stream Class I streams. A minimum 100 foot buffer is required along both banks of these streams (Tongass Timber Reform Act, 1991).

Riparian Management Opportunities
Sport fish potential……..High
Enhancement opportunities …Large wood placement, spawning channels.

These channels are generally accessible by small boat. Primary sport species are coho salmon and Dolly Varden char. Banks with overhanging shrubs and deep meander bend pools offer the best angling opportunities.

Where local sources of large wood are available, insertion of wood habitat structures can improve cover and pool habitat in FPB channels. FPB channel segments are typically spawning limited. Opportunities to develop spawning channels in upland tributary channels, having gravel substrate and ample groundwater recharge, can be explored, provided that existing rearing habitat is not already at its carrying capacity.


An FPE channel, non forested riparian vegetation.